SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FRIDAY, FEBRUARY 13, 1903.

CONTENTS:

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

SECTION F, ZOOLOGY.

SECTION F was organized at the Washington meeting on December 29, 1902, with the following officers:

Vice-President—C. W. Hargitt.

Secretary—C. Judson Herrick.

Fellow Elected to the Council—Charles L. Marlatt.

Sectional Committee—C. W. Hargitt, Vice-President, Washington meeting; C. Judson Herrick, Secretary, Washington meeting; C. C. Nutting, Vice-President, Pittsburgh meeting; C. W. Stiles, Secretary, Pittsburgh meeting; C. L. Edwards, to serve one year; H. F. Osborn, to serve two years; S. H. Gage, to serve three years; C. H. Eigenmann, to serve four years; H. B. Ward, to serve five years.

Member to General Committee—Herbert Osborn.

Meetings of the section for the reading of papers and other business were held on December 29, 30, 31 and January 1.

At a joint meeting of the section with the American Society of Zoologists, December 30, it was '*Resolved*, That it is the sense of this meeting that the *Concilium Bibliographicum* of Zurich is of the greatest value to zoologists, and it is recommended to the Carnegie Institution for financial assistance.'

The following papers were presented before the section:

Tadpoles of the Green Tree Toad (Hyla versicolor) and Comparison with the Common Toad (Bufo lentiginosus): Simon H. Gage, Cornell University.

The most obvious, although by no means the most important, change in transformation is the disappearance of the tail. Comparing the common and the tree toad, it was found that in the tadpoles of the common toad the tail shortened 4.6 mm. in 24 hours, while that of the tree toad shortened 24 mm. in 24 hours, or more than five times as rapidly as the common toad. Although the common toad is considerably larger than the tree toad, the tadpoles of the latter are much the larger—that is, from two to three times the length from tip to tip. If one compares the percentage of the total length which disappears in the two cases, it is found that in *Bufo* the diminution is 25.5 per cent., while in *Hyla* it is 47 per cent. in 24 hours. That is, the relative as well as the absolute amount of shortening is greater in the tree toad in a given time.

In coloration the common toad tadpoles are entirely black or barred. The small tadpoles of *Hyla* are less deeply pigmented, but of nearly a uniform shade. As the tadpoles approach their greatest perfection as tadpoles, the coloration assumes a brilliant red, mottled with black. This makes them very conspicuous. The appearance is especially striking when the sunshine is strong. When transformation approaches, the green color so characteristic of younger tree toads appears on the body, and the red may become less brilliant in the tail, but often that remains and the animal is brilliant in red and green.

Every effort to get at the meaning of this coloration in the tadpoles was unsuccessful. It can not be for attraction, as the animals are immature. It can not be for protection, as there are no similarly colored objects in the water. It can not be a warning color, as the animals are readily eaten by animals living more or less on tadpoles.

The Habits of Cryptobranchus: Albert M. Reese, Syracuse University, Syracuse, N. Y.

Cryptobranchus alleghaniensis, or hellbender, occurs in great numbers in streams of the Ohio valley, but is apparently seldom found outside of that region. It sometimes reaches a length of 60 cm., and though it is a repulsive looking animal, and has the reputation among fishermen of being poisonous, it is really a most harmless and inoffensive creature.

Respiration in the adult is by means of well-developed lungs, but there is a persistent gill-opening on each side of the throat. Air for respiration is taken in by a curious swallowing motion, and is exhaled partly by a quick expiration, when the animal comes to the surface to breathe, and partly by bubbles set free as the animal lies on the bottom. In captivity, the respiration intervals seem to be quite variable, the average length of time between inspirations being about 15 minutes, the longest recorded interval being 43 minutes.

Under natural conditions, the hellbender seems to be a remarkably voracious animal, living chiefly on small fish, crayfish, etc., but in captivity its appetite is quite moderate, a few small pieces of raw liver once or twice a week being all that it will eat in the summer, while in the autumn several specimens kept under observation in a tank refused to eat during a period of over two months. One morning at the end of this long voluntary fast, a black object was seen projecting from the mouth of a large hellbender which, on closer examination, proved to be the tip of the tail of a smaller individual which had been swallowed head first. By means of forceps the small hellbender was rescued from his strange pre-

dicament, and immediately swam away, none the worse for his terrible experience. Even after this apparent evidence of returning appetite, the hellbenders ate but little of the liver that was given them. Their remarkable tenacity of life is shown by the fact that an individual that escaped from the tank lived for three weeks without food and water.

Nothing was learned as to the breeding habits except the fact that they will not breed in captivity, unless, perhaps, they are captured just before their natural spawning season.

Sense of Hearing in Fishes: G. H. PARKER, Harvard University, Cambridge, Mass. To be published in *Bull. U. S. Fish Commission.*

The presence of an internal ear in fishes led Hunter, Müller, Owen and other physiologists to ascribe hearing to these animals. The fact that after the loss of the ear fishes lose their equilibrium, but still respond to sound waves if intense enough, led Kreidl and especially Lee to conclude that the internal ears of fishes were for equilibration and not hearing, and that sound waves stimulate the skins of fishes, not their ears. Fishes, therefore, feel sounds, but do not hear them. *Fundulus heteroclitus,* after having had the nerves to its integument and to its lateral line organs cut, thus rendering its skin insensitive, still responds by fin movements to sound waves, but ceases so to respond after the nerves to the internal ears are cut. *Fundulus heteroclitus,* therefore, responds to sound waves through the ear—that is, it hears.

Breeding Habits of the Yellow Catfish (Ameiurus nebulosus): HUGH M. SMITH. To be published in *Bull. U. S. Fish Commission.*

This paper is based chiefly on observation of a pair of fish from the Potomac River in the Fish Commission aquarium at Washington. They made a nest on July 3, 1902, by removing in their mouths upwards of a gallon of gravel from one end of the tank, leaving the slate bottom bare. On July 5 about 2,000 eggs, in four separate agglutinated clusters, were deposited between 10 and 11 A.M. on the scrupulously clean bottom. Ninety-nine per cent. hatched in five days in a mean water temperature of 77° F. The young remained on the bottom in dense masses until six days old, when they began to swim, at first rising vertically a few inches and immediately falling back. By the end of the seventh day they were swimming actively and most of them collected in a school just beneath the surface, where they remained for two days, afterwards scattering. They first ate finely-ground liver on the sixth day, and fed ravenously after the eighth day. The fish were 4 mm. long when hatched, and grew rapidly, some being 18 mm. long on the eleventh day, and at the age of two months their average length was 50 mm.

Both parents were very zealous in caring for the eggs, keeping them agitated constantly by a gentle fanning motion of the lower fins. The most striking act in the care of the eggs was the sucking of the egg-masses into the mouth and the blowing of them out with some force. The fanning and mouthing operations were continued with the fry until they swam freely, when the care of the young may be said to have ceased. During the first few days after hatching, the fry, banked in the corners of the tank, were at irregular intervals actively stirred by the barbels of the parents, usually the male. The predaceous feeding habits of the old fish gradually overcame the parental instinct; the tendency to suck the fry into their mouths continued and the inclination to spit them out diminished, so that the number of young dwindled daily and the 500

that had been left with their parents had completely disappeared in six weeks, although other food was liberally supplied.

The Effect of Low Temperatures on Mosquito Larvæ: John B. Smith, New Brunswick, N. J. To be published in Final Rep. of Mosquito Investigation, N. J.

Mosquitoes were, until recently, supposed to hibernate as adults, and it was believed that low temperatures checked or absolutely prevented the development of larvæ.

A series of observations made in New Jersey during the winter of 1901–02 and the last months of 1902 indicate that even freezing temperatures do not entirely prevent development, though they may delay it. The species vary in method of hibernation, some living through as adults, some as larvæ, and some in the egg stage. None winter as pupæ. The larvæ that hibernate may be frozen solidly in ice and will come to no harm. Temperatures down to zero (Fahrenheit) do not prevent final maturity, and the freezing and thawing may be repeated several times during the winter without bad effects.

Of species that hibernate as adults, many larvæ of the later broods are caught by frosts and may be ice-bound for a time without harm. The larvæ of *Culex pungens* have been observed in a pail coated with ice one fourth inch thick, barred absolutely from access to the outer air for several hours, and they completed their development in due time after the ice disappeared. Pupæ of the same species have been frozen in a solid mass of ice and transformed into adults later.

Concerning *Anopheles punctipennis* the same observation has been made, and both larvæ and pupæ were taken from pools that had been completely ice-coated for several hours.

Species which in the larval stage have survived freezing, or at least being bound in ice-covered pools, are *Anopheles punctipennis, Culex canadensis, Culex sylvestris, Culex pipiens, Culex restuans, Culex territans, Aedes smithii* and *Corethra brakeleyi.* Of *Aedes smithii* it is positively known that it winters in the larval stage only; of *Anopheles punctipennis* and *Culex pipiens* it is positively known that they winter as adults only. Of *C. canadensis* and *C. sylvestris* it is believed that they winter in the egg stage; but it is not certain that they do not also winter as larvæ. Of *C. territans* it has been said that it winters as an adult, but the larvæ are found very late in winter and very early in spring.

Notes on the Natural History of Some of the Nudibranchs: W. M. Smallwood, Syracuse University, Syracuse, N. Y. To be published in *Bull. Syracuse University.*

During the past summer at Woods Holl the following nudibranchs were secured: *Montagua gouldii, Montagua pilata, Doris bifida, Æolis papillosa* and *Elysia chlorotica.* The classification is according to Verrill.

Montagua gouldii was found in large numbers in the colonies of *Tubularia crocea. Montagua pilata* was taken by dredging. *Doris* and *Æolis* were found at low tides on rocks and weeds. *Elysia* was taken in a tow-net, but did not lay while under observation; the other forms laid very freely in common glass aquaria.

One hundred and fifty specimens of *Montagua gouldii* laid 929 masses of spawn within nine days after being brought into the laboratory, and hundreds of egg masses might have been collected from the hydroids from which these were taken. The spawn was scattered or laid in nests;

it is small and fan-shaped, containing about 500 eggs.

The ends of the oviducts in the copulation of *M. pilata* become firmly united, so that the animals may be pulled about with considerable freedom. While in copulation the swollen ends of the oviducts are spherical in form and the color is intensified. It may take three hours for the distended oviduct to become completely retracted. The egg mass is laid in the form of a straight or undulating string frequently six inches long. There are from two to eight eggs in a single section of the string. Deposition occurs from twelve to twenty-four hours after copulation.

The spawn of *Doris* is long and ribbon-like, one fourth of an inch wide. The eggs are arranged in regular rows at right angles to the long axis of the spawn mass.

Æolis papillosa lays about forty separate, oval, salmon-colored egg masses, all of which are united into one large, gelatinous mass.

Death-feigning in Sand Fleas: S. J. HOLMES, Ann Arbor, Mich.

Death-feigning in the large sand-flea, *Talorchestia longicornis,* is a pronounced instinct. This species is nocturnal in its habits, and during the day lies curled up in its burrows in the sand in a condition apparently much like the sleep of higher animals. When dug out of its burrows, *Talorchestia* may remain curled up and motionless, or it may assume such a condition after a few hops in the sand. In assuming the death-feigning attitude, *Talorchestia* flexes its body, draws up its legs, and bends its antennæ under the thorax. It will then remain motionless, often for a long time, and may usually be picked up without betraying any evidence of animation. The utility of such an instinct is obvious, as it enables its possessor to escape detection. By lying quiet in the sand, which it closely resembles in color, *Talorchestia* would easily be overlooked by predatory birds and mammals, whereas if it endeavored to escape by hopping away, its large size would render it an easy victim.

The terrestrial amphipods form a group which has only recently adopted the habit of living upon land. The instinct of death-feigning is, therefore, one of recent origin, as it is one which has doubtless been acquired in adaptation to the habit of living above water on sandy beaches. We naturally look to the behavior of the aquatic relatives of this species and of other terrestrial forms for light upon the origin of this instinct. Two other species found on the New England coast, *Orchestia palustris* and *O. agilis,* fortunately exhibit intermediate modes of behavior which connect the death-feigning instinct of *Talorchestia* with the so-called thigmotactic reactions of the aquatic amphipods. Nearly all the littoral species of aquatic amphipoda manifest a strong propensity to keep in contact with solid objects. When free from contact they are restless. They usually endeavor to insinuate themselves between objects, so as to secure a maximum of contact; then they lie quiet, usually with the antennæ bent back and the body flexed.

The behavior of the two species of *Orchestia* studied shows that they possess certain fundamental features of conduct in common, and that the death-feigning of *Talorchestia* is nothing but an exaggeration and specialization of the thigmotactic proclivity which these forms share with the aquatic amphipoda.

Variation and Natural Selection in Lepidoptera: H. E. CRAMPTON, Columbia University.

The relation between the process of

elimination and variation in *Philosamia cynthia* was first considered. It was shown that pupal elimination is directly related to variation, selection being 'secular' (with reference to type) as well as 'periodic' (with reference to variability). *Samia cecropia* exhibits only periodic selection. Reproductive selection appears clearly in *Samia cecropia*.

The Tortugas as a Biological Station for Research: ALFRED G. MAYER, Museum of the Brooklyn Institute of Arts and Sciences.

The Tortugas occupy what is probably the most favorable situation from which to study the tropical life of the Atlantic Ocean. Extensive coral reefs surround the islands, and in the immediate neighborhood one finds reef flats, sandy bottoms, coral mud and a great variety of habitats for a rich and varied fauna. Pure deep ocean water surrounds the group, and their separation from the Florida coast is sufficient to prevent the impure water of the mangrove swamps from contaminating the ocean water of the Tortugas. It is, therefore, possible to maintain larvæ alive for many weeks in aquaria. The temperature of the surface waters in the immediate vicinity of the Tortugas is remarkably high, being from 74° to 77° in winter and 80° to 86° in summer. It is, therefore, warmer than any other part of the Atlantic Ocean, excepting the Bight of Biafra, and is almost identical in temperature with the waters surrounding the Fiji Islands. The northern edge of the Gulf Stream lies about twenty-five to thirty miles south of the Tortugas, but the prevailing easterly and southerly winds of the spring and summer months drive the surface waters of the Gulf Stream upon the shores of the Tortugas, thus drifting in great numbers of pelagic animals, which cause the surface tows to be richer in this region than at any other place known to the writer, and comparable only to the condition observed in the region of the Kuroshiwo, in the neighborhood of the Philippine Islands.

The pelagic fauna of the Tortugas contains representatives from the coast of Africa and from the entire tropical Atlantic, and is in general remarkably similar to that of the Fiji Islands, although specific distinctions between related forms of Fiji and Tortugas can usually be determined. This close relationship is probably due to the similarity of the temperature and the conditions of the reefs.

The fauna of the Tortugas is strictly tropical. Its special advantages over any station on the Florida coast are purity of the water and the richness of the fauna. In these it appears to be superior also to the West Indies, the Bahamas, and very much richer than the Bermudas. The climate is healthful, and although in the summer months the humidity is very great, it is possible to maintain perfect health and energy throughout the hot season. The recent establishment of a naval coaling station at the Tortugas has made it easily accessible from Key West.

The Phasmidæ, or Walking-sticks of the United States: A. N. CAUDELL, U. S. National Museum. To be published in *Proc. U. S. Nat. Mus.*, Vol. XXVI., 1903.

This paper gives, in monographic form, tables for the separation of the Phasmidæ into subfamilies, genera and species, only the forms of North America north of Mexico being included. A few prefatory paragraphs are given bearing upon the nature and habits of the species composing the family. Four subfamilies are recognized, one, Timeminæ, being described as new, based upon a very remarkable forficulid-like form from California. Three genera and as many species are described

as new and one species, *Timema californicum,* first mentioned by Professor Scudder some years ago, is here described for the first time. Four plates are given, illustrating species of all the genera.

The Morphology of Clasping Organs in Certain External Parasites: HERBERT OSBORN, Ohio State University.

The adaptations of parasitic animals afford numerous striking cases of structural specialization, and in this paper certain highly modified organs for adherence in Pediculidæ are described and their homologies discussed. In *Hæmatopinus urius* there is a protractile disk on the distal end of the tibia, which from its position must be applied to the hair opposite the tarsal claw. In *Hæmatopinus macrocephalus* an organ in the same position has more convex membranous surface, and distinct internal muscles. In both the disk and the spines on its border evidently arise from the chitinous wall, but their musculature is problematic. In *Euhæmatopinus abnormis* the posterior legs are greatly modified, the femur and tibia each with expanded disk, the former opposed to the middle femur and the latter to a special structure in the margin of the abdomen, both evidently serving to strengthen the grasp on hairs or fur, or to give greater rigidity in position. Other special structures are noted in antennal joints, in abdominal brushes, ridged tarsi, etc.

Description of Four New Species of Grasshoppers, and Notes on Other Orthoptera from Colorado, Texas, Arizona and New Mexico: A. N. CAUDELL, U. S. National Museum. To be published in *Proc. U. S. Nat. Mus.,* Vol. XXVI., 1903.

This paper treats of more than 150 species of Orthoptera, mostly collected in Colorado during the summer of 1901 by Dr. H. G. Dyar and the writer, though species from the other states mentioned in the title are included. The location and altitude of the various places visited in Colorado are given, and every species taken is listed, if only for the value attached to records of exact locality. Many of the species are represented in considerable numbers and thus present opportunities for studies in variation. Four new species are described, and two species of Blattidæ are recorded for the first time from the United States. One plate is given, comprising figures of the new species.

An apparently unrecorded fact regarding the large lubber grasshopper of the South, *Dictyophorus reticulatus* Thunberg, is noted. Both sexes of this brightly colored insect make a distinct simmering or bubbling sound when disturbed. This sound was found to proceed from a gland, probably a modified spiracle, opening from the side of the body above and slightly behind the middle coxa. The sound is made by the insect's forcing out very minute bubbles of a clear liquid with sufficient force to cause a sound capable of being heard for some distance. Whether this liquid has repelling properties and the resulting sound is purely mechanical, or whether the production of sound is the object of the mechanism, was not determined. The conspicuous warning colors of the insect would rather indicate the former supposition.

The Colorado collection seems to indicate the existence of but three faunal zones in that state instead of four, as indicated by the lepidopterous fauna as pointed out by Dr. Dyar in the *Proceedings of the United States National Museum* (XXV., 369, 1902). The Orthoptera show no distinct indication of a separate faunal zone on the western slope.

A Review of Certain Attempts to Introduce the Eastern Oyster into the Bays on the Oregon Coast: F. L. Washburn, State Entomologist, St. Anthony Park, Minn.

Encouraged by the reported finding of eastern spat in abundance in San Francisco Bay in 1890, it was resolved by the state authorities in Oregon in 1896 to attempt to induce the eastern oyster to propagate in the bays of the Oregon coast, and to that end an appropriation was secured in the legislature, as was also the cooperation of the United States Fish Commission. The work was in charge of the state biologist. In 1896 twenty-two barrels of two-year-old oysters, and in 1900, ten barrels, were shipped from New York state. The first of these consignments was on the road twelve days, and the second eight days, but the oysters nevertheless arrived in excellent condition, the loss not exceeding a fraction of one per cent.

Various means were resorted to to make a success of the experiment. The oysters were placed upon a portion of ground which is a natural bed for the native northwest coast oysters, and where abundance of food could be obtained. Artificial fertilization was practiced and millions of fertilized eggs were poured into the bays at different times. Oysters were placed in floats and artificial ponds, and in cemented tanks; in fact, nothing was left undone which was within the power of the biologist. Little or no results came from these experiments. The strong, cold northwest wind which prevails almost every day in summer on the northwest Pacific coast not only chills the surface of the water of the bays, but appears to force into all the inlets an immense amount of ocean water which has an average summer temperature of about 55° F. and a salinity of 1.025. The water in all the bays of Oregon is quite cold on the flood tide, the writer having seen it change from 70° F. and a density of 1.016 at low tide to 57° F. and a density of 1.022 at high tide within six hours, and this at a distance of seven miles from the ocean. These conditions of temperature and salinity and such marked changes are all unfavorable for the developing spawn. Only one or two specimens have been found which were undoubtedly hatched on that coast.

Although these experiments in propagation were a failure, the transplanted oysters attained an immense size in a short time, and were all of such excellent quality that the importation and fattening for sale of eastern oysters in the markets of the northwest coast offer inducements to capital.

Some Recent Cytological Investigations in their Bearing on Mendel's Principles of Heredity: E. B. Wilson, Columbia University.

Abstract of this paper has appeared in Science, N. S., XVI., No. 416, December 19, 1902.

Provisional Program for Continuation of Researches on Cave Fauna: C. H. Eigenmann, Indiana University.

A Reconnaissance of Faunal Conditions in Jamaican Waters: Hubert Lyman Clark, Olivet, Mich.

Report of a recent visit to Jamaica, including: (1) Observations of echinoderms, (2) variation in the genus *Stichopus,* and (3) an apparently new parasitic turbellarian.

The three preceding papers were read at a joint session of Section F and the American Society of Zoologists.

On a Small Collection of Crustaceans from the Island of Cuba: William Perry Hay, Howard University, Washington, D. C. To be published in *Proc. U. S. Nat. Museum.*

The paper contained notes on a collection of crustaceans from the caverns and coastal streams of Cuba submitted to the author by Dr. C. H. Eigenmann, of the State University of Indiana. There are altogether fourteen species, of which three —*Cirolana cubensis, Palæmonètes eigenmanni* and *Palæmonetes cubensis*—are new to science.

Cirolana cubensis and *Palæmonetes eigenmanni* are spelean species exclusively and have the usual characteristics of such forms—they are slender, transparent and blind. Full descriptions and figures of the new species were given. Under the notes on *Cambarus cubensis,* attention was called to some rather unusual characters shown by the specimens collected by Dr. Eigenmann which may by future work be shown to mark a distinct species.

The collections were made in the early spring of 1902, through the assistance of a grant of money by the American Association for the Advancement of Science.

Evolution of the Proboscidea in North America: H. F. OSBORN, American Museum of Natural History, New York city.

From the oldest certainly known form, *Palæomastodon* of Egypt, through the Lower Miocene *M. angustidens* of Europe, the Proboscidea migrated to America. In the Middle Miocene at least three and possibly four contemporary phyla appear in this country. The first phylum, distinguished (1) by laterally compressed upper tusks, (2) short lower tusks, (3) narrow molars with a single trefoil, includes the Middle Miocene *M. productus* Cope and the Upper Miocene and Pliocene *M. floridanus* Leidy, *M. obscurus* Leidy, *M. tropicus* Cope, *M. serridens, M. rugosidens* and possibly *M. præcursor* Cope. The second phylum, with (1) round upper tusks and (2) a double trefoil on long narrow molars, includes the Upper Miocene *M. campester* Cope and possibly *M. humboldtii* of South America, a Pliocene or Pleistocene form. The third phylum, distinguished by (1) long lower tusks, with enamel in the early stages, (2) laterally compressed upper tusks, (3) short posterior molars, includes *M. brevidens* Cope (the oldest species known in North America), *M. euhypodon* Cope from the Upper Miocene and possibly *M. shepardi* Leidy from the Pliocene. In the Pliocene appears the highly specialized *M. (stegodon) mirificus* Leidy, with (1) round upper tusks, (2) double trefoil, (3) only four grinding teeth altogether. This may connect with the *M. campester* series, or it may represent a new arrival from Europe. The early Pleistocene includes two superb elephants, *E. columbi* of the Middle and Southern States, and *E. imperator* of the Southwest. Both these species can now be clearly distinguished from the true northern mammoth, *E. primigenius.* The paper is illustrated by numerous drawings and photographs. Acknowledgments were made especially to Mr. F. A. Lucas.

Primary Division of the Reptilia into Two Great Groups Phylogenetically Distinct: HENRY F. OSBORN and J. H. MCGREGOR, Columbia University. Presented by Henry F. Osborn; will be published elsewhere.

Some Questions as to the Arrangement of the Primates: B. G. WILDER, Cornell University.

This paper embraces four parts:

(*a*) A provisional dichotomous arrangement of the Primates in which the main stem, terminating in man, gives off branches representing successively the lemurs, the marmosets, the New World monkeys, the Old World monkeys, the gibbons and the giant apes. Of this last group one subdivision includes the two African apes, the gorilla and chimpanzee,

and the other the orang. The general principle of dichotomy was followed by the author with respect to the entire animal kingdom in a paper before this association in 1887, and is believed by him to be equally applicable to the primate order.

(*b*) But questions and difficulties arise in connection with all the divisions. For example, the extinct *Pithecanthropus* is not included, and there is no hint of the possibility of a closer affinity between *Tarsius* and the tailless apes. As to the latter, the less divergence of the gibbons from the tailed monkeys has been urged by Chapman, but he regards the gibbons and orang as 'closely related,' whereas the present arrangement, mainly on cerebral grounds, places the orang nearer man than either the gorilla or the chimpanzee.

(*c*) The author believes that, eventually, all the divisions and subdivisions may be based upon encephalic characters alone, but at present, even where the brains are recognizably different, it is not always possible to formulate the distinctions.

(*d*) In order to determine the validity of this belief, it is necessary to compare the brains of all genera and if possible all species, and several of each. One of the author's graduate students, Mr. T. L. Hankinson, spent most of last year in the effort to determine the fissural differences between the Old and New World monkeys, but his appointment to a college position has interrupted the work for the present. Among the genera of which more examples are desired are *Hylobates, Nasalis, Semnopithecus, Colobus, Brachyteles, Pithecia, Brachyurus, Nyctipithecus* and all lemurs.

Male Preponderance (Androrhopy) in Lepidopterous Insects: A. S. Packard, Brown University.

Eimer ('On Orthogenesis,' etc., 1898) calls attention to what he calls the 'law of male preponderance,' or the fact that the male is ordinarily a step or so in advance of the female in expressing the direction of development, and then transmits in a certain measure his characters to the species. This, he adds, may occur exceptionally in females, so that there is a law of female preponderance. He takes his examples from the markings of *Papilio,* of lizards and of birds of prey.

There are numerous cases among other lepidoptera than butterflies. Male preponderance, as we understand it, is a general law of animal life. The female is the conservative sex, the male, as is well known, the more variable, the more active and aggressive, and the founder of new structures or markings characterizing new varieties and species.

For the principle of male preponderance we would propose the term *androrhopy* (*'ανδρειος*, male; *'ροπη*, preponderance), and when female preponderance exceptionally occurs, it might be called *gynerhopy* (*γυνή*, female; *'ροπη*, preponderance).

Very obvious examples of androrhopy occur in the Saturniidæ. In this group the females have aborted mouth-parts, they are very heavy and sluggish, inactive, flying, if at all, but a short distance from their birthplace. On the other hand, the male is more active and energetic, will fly for miles in search of the female, guided by the odor emanating from her body. The male is thus exposed to a greater variety of environmental conditions. An example is seen in the genus *Saturnia* (*i. e., S. pavonia-minor*) of male divergence from the form and markings of the female; otherwise gynerhopy prevails in this genus.

In the tailed forms, especially the group represented by *Graëllsia, Arzema, Actias,* and *Tropæa,* the effects of the inheritance of male characteristics is seen to have af-

fected this whole group. Comparing the two sexes of the primitive form of *Graëllsia* with their hind wings briefly tailed, the males have much the longer 'tails.' In *Actias selene* the tails are nearly of the same length in both sexes, but in *Tropœa luna,* perhaps the most recent form of the group, the tails in the male are decidedly longer than in the other sex. In *T. artemis* of Japan there is a tendency to revert to the *Graëllsia* form of tail, as they are very short. The principle is seen also in regard to the markings and coloration in general.

From the prepotency of the male of some ancestral form similar to this insect, the tailed forms of the large green moths living in Africa, Asia, and our American *Tropœa luna* may have originated.

Other striking examples of androrhopy are seen in the moths of an allied group (Sphingicampidæ), such as *Arsenura, Eudelia,* etc. This does not conflict with the apparent fact that the length of the tails of species of *Papilio* seems to depend on temperature, those living in boreal, cool, moist situations, or in cool, damp, elevated, mountainous regions, having the tails much shortened.

The Decapod Crustaceans of the Northwest Coast of America from Alaska to San Diego, California: MARY J. RATHBUN, United States National Museum, Washington, D. C.

This paper, which will be published among the results of the Harriman Expedition, embraces not only the material derived from that expedition, but the collections in the U. S. National Museum which have been obtained in the same region from the work of the U. S. Fish Commission steamer *Albatross,* the Coast Survey and other explorations. It includes a check-list of the Decapoda of the region, figures of many of the little-known forms, and much new information concerning them, especially as regards distribution.

Further Notes on the Heart of Molgula manhattensis Verrill: GEORGE WILLIAM HUNTER, Jr., New York city.

Research by means of the intra-vitam method of staining with methylene-blue points to a connection between the ganglion cells of the heart and those of the central nervous system. The course of the connectives is as yet not fully worked out.

The following physiological data seem to point to this connection in animals in which the ganglion or dorsal nerve chain is partly or wholly destroyed:

(*a*) The heart beat (variable within limits) is appreciably slower.

(*b*) A lack of coordination between the two ends of the heart appears.

(*c*) There is sometimes great irregularity in the heart rhythm.

(*d*) The heart beats on occasions for from two to three hours in a given direction without reversal. (The normal heart usually reverses every one to two minutes.)

Certain substances (caffein, muscarine, nicotine, strychnine, *et al.*), heart depressors or accelerators, which are believed to act upon nerve cells or endings in the heart or in the sympathetic system of vertebrates, act in a similar manner upon the normal heart of *Molgula.* In the cauterized animal, however, no such results are obtained.

On the Morphological and Physiological Classification of the Cutaneous Sense Organs of Fishes: C. JUDSON HERRICK, Denison University, Granville, Ohio.

The proper interpretation of these sense organs has heretofore not been possible, because the problem has not been approached with sufficient breadth of view. Taking into account structure, innerva-

tion and function as experimentally determined, we may classify as follows:

I. Organs of the general cutaneous system. Free nerve endings of tactile nerves.

II. Organs of the acustico-lateral system. Peripheral organs neuromasts, with hair cells among indifferent cells, the former extending only part way through the sensory epithelium. Innervation by nerves centering in the tuberculum acusticum and cerebellum. They present the following varieties:

1. Canal organs, regularly arranged in canals in the dermis or dermal bones, which communicate by means of pores with the outside. Function, perception of mechanical jars and maintenance of equilibrium.

2. Pit organs, similar to the last, but each in a separate pit. In lines.

3. Small pit organs, smaller than the last and irregularly distributed.

4. Ampullæ. Organs at the bottom of long slender tubes. Only in Selachii.

5. Vesicles of Savi. Closed vesicles, only in the torpedoes.

6. Cristæ acusticæ. In semicircular canals of all vertebrates. Function, equilibration (reaction to rotary movements).

7. Maculæ acusticæ. In sacculus and utriculus. Function, equilibration (reaction to translatory and static stimuli?) and hearing (?).

8. Papilla acustica basilaris. In organ of Corti. Function, hearing (does not occur in fishes).

III. Organs of the communis system. Special organs with the specific sensory cells extending through the whole thickness of the sensory epithelium. Present in the mouth of most vertebrates and in the outer skin of some ganoid and teleostean fishes. Innervation by communis nerves; primary cerebral centers gray matter associated with the fasciculus communis (= f. solitarius), represented by the vagal and facial lobes of fishes. Function, taste. Two forms, differing only in position.

1. Taste buds, within the mouth.

2. Terminal buds, in the outer skin, often on barblets or other specialized organs for their reception.

Observations on Footprints in Beach Sand: Herbert Osborn, Ohio State University, Columbus, Ohio.

The observations recorded represent occasional studies during three summers on sand of Cedar Point Beach and adjacent dunes. Photographic records have been secured of as many of these as it has been possible to identify with certainty, and a few others of particular interest or rarity. The camera was adjusted to a vertical position by the use of a brass plate bent at right angles, and the best results were secured in the latter part of the afternoon, when oblique rays of the sun cast strong shadows in the tracks. Lantern slides from the photographic records, including *Hesperomys leucopus, Ardea herodias, Eurenetes pusillus, Emys meleagris, Coluber vulpinus, Heterodon platyrhinus, Bufo lentiginosus* var., *Microbembex monodonta, Trimerotropis maritima, Fontaria indianæ* and *Myrmeleon* sp. were shown and their characters described.

Such records are serviceable in determining the presence of particular animals in a given region, as presenting an interesting feature in the biology of the animal, and as a basis for comparison in studies of the imprints left by extinct animals.

An Exhibit of Lantern Slides Illustrating the U. S. S. 'Albatross' and her Work: C. C. Nutting, University of Iowa.

Lantern slides taken by the author during the recent Hawaiian cruise, accompanied by an informal account.

The Eyes of a Specimen of the Cuban Blind Fish, Lucifuga, and those of Her Four Young (with lantern slide illustrations): C. H. EIGENMANN, Indiana University.

Faunal Characteristics of the Sandusky Region: HERBERT OSBORN, Ohio State University, Columbus, Ohio.

The Sandusky region as here defined includes parts of Erie, Sandusky and Ottawa counties, Ohio. Practically all the faunal elements of the region are to be found within five miles of the city of Sandusky. A brief summary of faunæ represented and the faunal conditions afforded is given, with illustrations in different groups. The region includes a lowland and partially timbered area of rather rich vegetation and diverse fauna; a beach and sand-dune fauna; a swamp and marsh fauna; a fauna pertaining to rocky coast and island, and one peculiar to a prairie area, approaching plains conditions in scant flora; aquatic faunæ pertaining to bay, coves, river and lake, with abundant plankton, nekton and littoral elements.

Protoplasmic Old Age: GARY N. CALKINS, Columbia University, New York city.

The 'A series' of *Paramœcium* experiments died out December 19, 1902, in the 742d generation. The last few individuals were perfectly normal so far as size, feeding, etc., were concerned. The history of the series tends to the conclusion that there is a definite potential of dividing energy which is possibly connected with a definite substance of the cell—archoplasm or kinoplasm.

The Structure, Development and Function of the Torus longitudinalis of the Teleost Brain: PORTER EDWARD SARGENT, Cambridge, Mass.

Morphology.—The torus longitudinalis, as typically developed, consists of a pair of longitudinal ridges or pads projecting downward from the thin median portion of the mesencephalic roof and extending from the posterior commissure through the length of the mesencephalon. The form and relative size of the torus, and consequently its relations to the surrounding structures, vary greatly in the hundred or more species examined.

Ontogeny.—The torus longitudinalis is developed from the roof of the mesencephalon as a longitudinal thickening of its median portion. More exactly, each lateral lobe of the torus is differentiated from the mesal edge of the tectum of the corresponding side, the precise mode differing somewhat in the different groups of teleosts.

Finer Anatomy.—Each lobe of the torus has a framework of radiating ependymal fibers. The nerve cells are of relatively small size, and frequently are arranged in parallel rows between the ependymal fibers. The cells are usually bipolar, but ultimately give rise to three sets of neurites. The first forms the tractus torotectalis, which runs into the tectum and ends in the superficial fiber zone in contact with the retinal fibers of the optic nerve. Another set of fibers passing out of the torus with the preceding forms the tractus toro-cerebellaris, which courses obliquely around the lateral border of the optic lobe and enters the cerebellum. The third set of neurites forms the tractus torofibræ Reissneris, which enters the ventricle in separate fascicles, there becoming united to form the compact fiber tract known as Reissner's fiber.

Function.—The cells of the torus are, then, in connection by their afferent neurites with the endings of the optic nerve, and by their efferent neurites with the body musculature through Reissner's fiber. It is evident, therefore, that the torus longitudinalis is the nerve center for the receipt of those impulses coming in over

the optic nerve which call for quick reflexes.

Homology.—It follows, then, that the cells of the torus longitudinalis constitute a nidulus of cells of common function, homologous with cells of similar function which occur in the anterior dorsal portion of the optic lobes of other vertebrates, and which have been designated as the 'Dachkern,' 'nucleus magnocellularis,' etc.

Phylogeny.—The nidulus of cells which gives rise to Reissner's fiber and constitutes the torus longitudinalis of teleosts is one of the most archaic elements of the vertebrate brain. As an independent structure, however, the torus has its beginnings in the ganoids, resulting from the crowding downward of the nucleus magnocellularis so as to form two incipient longitudinal ridges on either side of the median plane. In the Siluridæ, mechanical causes are still operative, but in the more highly differentiated teleosts the torus appears at an early stage of ontogenetic development as the result of phylogenetic causes.

An Unusual Attitude of a Four-weeks Human Embryo. Comparisons with the Mouse: SUSANNA PHELPS GAGE, Ithaca, N. Y. Illustrated by wax models. To be published in the *Journal of Anatomy.*

1. The specimen cut in the membranes shows the body axis lying in two planes at right angles to each other, the torsion occurring in the neck region. The attitude suggests: (*a*) that the great growth of the heart and the umbilical region on the left may have produced the torsion mechanically; (*b*) that the pulsations of the heart have produced a passive rotation, or (*c*) that the rapidly developing muscle cells may already at this early stage have a slight power to produce motion.

2. A very early mouse embryo—that is, with nine myotomes—shows a sharp bend in the region of the fourth to the sixth myotome, that is, in the cervical region. In the early human embryos so familiar from His' illustrations which show a similar sharp bend and have by some been considered as distorted, the bend occurs in the region of the 12th to the 14th myotome, that is in the dorsal region. In both these human specimens and in the mouse in which no manipulative distortion was possible, the common feature is that the bend is over the opening of the yolk-sac. Rapid growth of the myotomes together with rapid narrowing of the neck of the yolk-sac might in either case produce the condition.

The Cranial Nerves of Squalus acanthias: OLIVER S. STRONG, Columbia University, New York city. To be published in the *Journal of Comparative Neurology.*

The principal object of the research has been to trace the components of the V., VII., IX. and X. nerves. In doing this special attention has been paid (*a*) to the verification, by study of serial sections, of the results obtained by Stannius, Ewart and others by dissection of selachians; viz., that the canal and ampullary organs are solely innervated by certain special roots and their branches (lateral line component); (*b*) to the separation of the communis (splanchnic-sensory and end-bud) component, which has not hitherto been done in selachians.

In no case thus far in this research have any branches of the V. nerve been traced to canal or ampullary organs. These organs in the head are innervated solely by the two lateral line roots of the VII. nerve which form the rami ophthalmicus superficialis VII., buccalis VII., mandibularis externus VII. and certain minor branches. The ramus mandibularis externus VII. is apparently derived practically entirely from the more dorsal of the two lateral

line roots, the ramus buccalis receiving the major part of the remainder of this root, while the ramus ophthalmicus superficialis VII. is principally composed of the bulk of the more ventral lateral line root. This would apparently negative the view that the ampullary organs are modified end-buds and the dorsal root an end-bud root.

In accordance with the results of previous investigators, the lateral line nerve of the trunk, which shows some evidence of being really compound, is found to be derived from a special root cephalad of the IX. and X. An interesting point is that the anomalous branch of the IX. nerve to canal organs is in reality composed of fibers derived from a small separate lateral line root.

The communis root of the VII. nerve separates, distal of its ganglion, into a ramus palatinus innervating the roof of the mouth, into certain minor branches, oral and spiracular, and into the ramus mandibularis internus innervating the floor of the oral cavity. The numerous roots of the vagus are rearranged distally to the vagal ganglia into the branchial nerves, which divide into the usual pre- and post-branchial branches, the former containing communis, the latter communis and motor components, the former component innervating the lining of the pharyngeal and branchial cavities. Thus the communis component was found to conform to the general type found in other forms.

A Dissecting Pan and a Substitute for Beeswax: E. L. MARK, Harvard University, Cambridge, Mass. To be published in the *American Naturalist.*

A specimen of the dissecting pan used in the Cambridge laboratories was exhibited and its advantages over those in general use were explained. There was also described a mixture of mineral and vegetable waxes, which is better and much cheaper than the beeswax usually employed in pinning out objects to be dissected under fluids.

White Feathers: R. M. STRONG, Haverford, Pa.

No white pigments have been found in feathers; the color of white feathers has been explained as due to a total reflection of the incident light from air spaces or bubbles in the feather structure.

White feathers do not differ essentially in structure from gray, brown, black, red, orange or yellow feathers, except that no pigment of any kind is present. Though some of the white comes from the walls of the air-containing medullary cells of the barb, the larger portion is produced by the barbules which have no air spaces of sufficient size to be of any significance. The white effect, as with snow or powdered glass, is dependent upon the small size of the structural elements. These have a large number of surfaces so placed for any position of the eye that the angle of incidence equals the angle of reflection with a maximum reflection to the eye. There is almost no absorption by the unpigmented feather substance, and the amount of light transmitted through the feather from objects behind is so small as to be imperceptible to the unaided eye in the intense reflection of light.

Some Remarkable Fossil Fishes from Mount Lebanon, Syria: O. P. HAY, American Museum of Natural History, New York city. To be published in *Bull. Am. Mus. Nat. History.*

This paper gives an acount of three new primitive saw-fishes and of supposed new species of eels which possess ventral fins and a palatopterygoid arch.

The Bones of the Shoulder Girdle of Fishes: THEO. GILL, Washington, D. C.

The most characteristic system of bones of the pisciform vertebrates is manifest in the shoulder girdle, and the classes of selachians and typical fishes, or teleostomes, have been segregated under the name *Lyrifera*, on account of the character of this girdle. The main elements have the form of the ancient lyre and are connected by an inferior symphysis. In the selachians the lyriform pieces are simple cartilages with which the basal elements of the pectoral fins articulate. In the teleostomes dermal bones are added to the cartilaginous pieces. The cartilaginous pieces remain such in the dipnoans, crossopterygians and ganoids. In the ganoids and especially the sturgeons, an arch is developed. In the teleosts ossification supervenes and a disintegration of the structure results in three independent bones on each side. These bones have been variously named, and by the old anatomists were considered to be homologues of the arm and forearm—humerus, radius and ulna. The view of Gegenbauer, that the principal ones represented the scapula and coracoid, has been accepted by all recent ichthyotomists except in America. The consideration of the history of the nomenclature of osteology and the development of the bones, however, militate decidedly against the acceptance of such a view. Scapula and coracoid were given originally to the composite bone and its process familiar from manifestation in man and all eutherian mammals. The bones of fishes to which the names have been given are certainly not homologous, and consequently the application of the names is very misleading. These bones, in fact, are only developed as such in fishes specialized as teleosts and very remote from the primitive stock of the terrestrial vertebrates. A special nomenclature is therefore necessary for the bones of fishes. The so-called scapula has been designated as *hypercoracoid*, the coracoid as *hypocoracoid* and the Spangenstück or precoracoid as *mesocoracoid*. The mesocoracoid disappears in most fishes, all the acanthopterygians and offshoots from that stock being deprived of that ossicle. The modifications of the shoulder girdle and its several constituents afford excellent characters for taxonomy.

The Systematic Relations of the Fish Genus Lampris: THEO. GILL, Washington, D. C.

Very recently the foremost ichthyologist of Europe, Dr. Boulenger, has reexamined the osteology of *Lampris*, and especially the shoulder girdle, and has attained novel conceptions as to the affinities of that genus. The number of bones in the shoulder girdle of *Lampris* is the same as in ordinary acanthopterygian fishes, but two of them have been interpreted from a different standpoint than by his predecessors: (1) The very large bone which occupies the lower and posterior part of the girdle was considered by him to be a peculiar bone, named interclavicle, and homologized with a homonymous bone of the hemibranchs, and (2) the smaller one immediately above it and behind the bones supporting the pectoral fin was regarded as a 'coracoid' or hypocoracoid. Therefore Boulenger removed the genus from all connection with the scombroideans, near which it had always been assigned by previous ichthyologists, and found for it a place near the hemibranchs. In short, he considered *Lampris* as the representative not only of a peculiar family (Lamprididæ) but of an independent higher group named Selenichthyes and coordinated with the Hemibranchii and Lophobranchii; the three being associated together as representatives of a suborder to which the new name Catosteomi was given.

The conclusions thus enunciated are so startling and the authority so great that

the skeleton of *Lampris* was submitted to renewed examination. That examination forced the speaker to acceptance of the ideas of the older ichthyologists, rather than those of Boulenger; the four actinosts, or pterygials, of acanthopterygian fishes are recognized, and the coracoid of Boulenger is identified with the fourth actinost. The hypocoracoid is found in the great posterior bone called interclavicle by Boulenger. Thus the normal structure of an acanthopterygian fish is recognized. As a consequence, the genus is restored to the group of acanthopterygians. The forms and proportions of the principal bones of the shoulder girdle are nearly paralleled by undisputed acanthopterygians and relatives of the scombroideans—the Caproidæ or Antigoniidæ. Nevertheless, the differences between *Lampris* and all other fishes, as Boulenger has shown, are sufficiently great to entitle it to rank as the type of not only a distinct family (Lamprididæ), but a special superfamily (Lampridoidea).

C. JUDSON HERRICK,
Secretary.

SECTION G, BOTANY.

THE meetings of Section G of the American Association were held in Lecture Hall No. 1, on the first floor of the Columbian University Medical School. Sessions were held Tuesday morning, Tuesday afternoon and Wednesday morning, December 30 and 31, 1902.

The abstracts of papers presented are as follows:

Range of Variation in Eutypella glandulosa (Cke.) E. & E.: C. L. SHEAR, Department of Agriculture, Washington, D. C.

Eutypella glandulosa is a pyrenomycete growing on dead *Ailanthus glandulosus*. Specimens recently collected at Washington illustrate well the variability which may be expected in various parts of the plant and the conditions which seem to influence it. The parts most variable are the stromata, perithecia (number and shape) and ostiola (length and character of mouth). The stroma is sometimes almost entirely wanting, at other times well developed and conspicuously pulvinate. The perithecia vary in number from one to forty, and in shape from globose to pyriform, with all sorts of irregularities caused by pressure against each other. The ostiola are sometimes scarcely discernible, while in some specimens they reach 5 mm. in length. The tips are normally quadrisulcate, but in the long examples they are frequently acute and smooth. The asci and sporidia appear most constant, showing no corresponding variation in the extreme specimens noted. The variations found seem directly connected with the supply and the manner of supply of moisture during the development of the fungus; the maximum extreme in size and number of parts occurring where the branches bearing the plants were lying in a low place, and were more or less covered with matted grass. It is very desirable to determine the parts most variable and the range of variation in order to segregate correctly the different species in this as well as in other genera of pyrenomycetes.

Antithetic versus Homologous Alternation: DOUGLAS H. CAMPBELL, Stanford University.

Bryophytes have left scanty fossil remains, hence their relation to other forms must be deduced from comparative morphology. This discussion will concern itself with a single class of pteridophytes—the ferns. Antithetic alternation assumes that the sporophyte of the ferns is an elaboration of some bryophytic sporogonium; homologous alternation assumes that bryophytes and pteridophytes are not